

The Vaults Redevelopment Project
Traffic Impact Assessment
 400 Pine Street & 30 Howard Street
 Burlington, VT

January 18, 2017

Project Introduction

This Project proposes to redevelop “The Vaults” located at 400 Pine Street and 30 Howard Street in Burlington. Two existing commercial buildings, totaling ±10,500 sf, and a 2 apartment duplex will be demolished. In their place will be constructed a new ±25,500 sf building housing 2 apartment units, 6,950 sf of studio space and 15,450 sf of office space. Access to the Project will be via the existing curb cut onto Howard St. The curb cut serving the existing duplex will be closed. On-site parking (24 spaces) will be provided in an underground parking garage beneath the new building. Pedestrian access will be provided via new sidewalks connecting the building entrances to the existing City sidewalk on the north side of Howard St.

Project-Generated Peak Hour Trips

The weekday peak hour vehicular trip generation of the existing and proposed land-uses were calculated using published Institute of Transportation Engineers (ITE) trip generation rates¹ using the number of residential apartment units plus the gross floor area of commercial land-uses.

For the purpose of this traffic impact assessment (TIA), the two existing commercial buildings were classified as warehouse space (ITE Land-Use Category #150). Likewise, the trips generated by the two apartment units and the proposed office space were estimated using ITE Land-Use Categories #210 and #710, respectively. However, the ITE does not have a land-use category for “studios”. Several related land-use categories were compared for that space, including Recreational Community Center (#495), General Office (#710), and Research and Development Center (#760). Of those, Recreational Community Center estimated the greatest number of pm peak hour trips; and therefore has been used to develop the following trip generation estimates. Table 1 presents the resulting existing and proposed weekday peak hour trips.

Table 1 - Project-Generated Peak Hour Trips

ITE Land-Use Category	Determinant	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
<u>Existing</u>							
#150 - Warehousing	10,464 sf	19	5	24	3	11	14
#220 - Apartment	2 units	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>1</u>
Subtotal		19	6	25	4	11	15
<u>Proposed</u>							
#220 - Apartment	2 units	0	1	1	1	0	1
#495 - Recreational Community Center	6,950 sf	9	5	14	9	10	19
#710 - General Office Building	15,450 sf	<u>38</u>	<u>5</u>	<u>43</u>	<u>4</u>	<u>19</u>	<u>23</u>
Subtotal		47	11	58	14	29	43
Net Additional		28	5	33	10	18	28

¹ Trip Generation, Institute of Transportation Engineers, 9th Edition

Traffic Congestion

Located in a predominantly residential neighborhood, Howard St functions as an east-west collector linking the major north-south streets (Pine St, St. Paul St, So. Union St and So. Willard St) in the South End. Only the St. Paul St intersection is signalized; all of its other intersections are stop sign controlled.

Existing peak hour traffic volumes in the immediate vicinity of this Project were obtained from:

- » a week-long automatic traffic recorder count performed by the Vermont Agency of Transportation (VTrans) on Pine St north of Locust St (D444) on June 9-15, 2014.,
- » a weekday morning and afternoon peak period turning movement count performed by Chittenden Regional Planning Commission at the Pine St/Howard St intersection on June 25, 2014, and
- » a weekday 12-hour turning movement count performed by VTrans at the St. Paul St/Howard St intersection on August 4 & 5, 2016.

The results of the above traffic counts indicate the following traffic volumes and patterns:

- » The observed annual average daily traffic volume (AADT) on Pine St in 2014 was 11,060 vpd. The 2018 AADT, projected using VTrans' urban growth rates, is estimated to equal 11,400 vpd.
- » The estimated 2018 AADT on Howard St between Pine St and St. Paul St equals 2,000 vpd.
- » Observed morning peak hour (8:00 - 9:00 am) volumes on Pine and Howard Streets from the above turning movement count at the intersection of those two streets equal 1,130 vph and 166 vph, respectively.
- » Observed afternoon peak hour (4:45 - 5:45 pm) volumes on Pine and Howard Streets from the above turning movement count at the intersection of those two streets equal 1,255 vph and 235 vph, respectively.
- » Approximately 55% of the morning peak hour volume on Howard St is traveling in the westbound direction.
- » Approximately 75% of the afternoon peak hour volume on Howard St is traveling in the eastbound direction.

The impact of the additional peak hour trips generated by this Project will be attenuated somewhat by those trips traveling in different directions on Howard St. Based on existing traffic patterns, it is our opinion that a 50/50 split east and west represents a conservative estimate. Thus, this Project will add 17 new am peak hour trips each at the Pine St/Howard St and the St. Paul St/Howard St intersections. The added pm peak hour trips equals 14 at each intersection.

This Project's impact on future levels of service and average delays was analyzed by performing both no-build and build capacity analyses at the Pine St/Howard St intersection, and comparing the results of the two sets of analyses. The results of those analyses, which are summarized in Table 2, indicate that this Project will have a negligible effect on existing and future traffic congestion conditions. They further indicate that the Pine St/Howard St intersection will operate at Level of Service C² during both the morning and afternoon peak hours. Detailed analysis worksheets are enclosed in **Appendix A**.

Safety

The posted speed limit on Pine and Howard Streets is 25 mph. Both streets provide one travel lane in each direction, with on-street parallel parking permitted in front of businesses and residences along much of their length. In the area of the Project, sidewalks are provided on the east side of Pine St and on the north side of Howard St. Pine St also has a designated bicycle lane on its west side in the southbound direction. There are no physical conditions (e.g. inadequate sight distances, sharp curves or steep grades) along Pine St or Howard St that would potentially cause unsafe conditions.

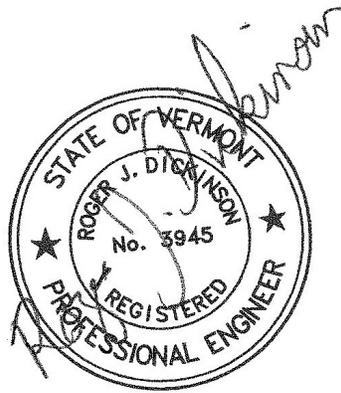
² Levels of Service (LOS) range from A to F; with A representing no congestion and F representing extreme congestion.

Based on the 2010-2014 five-year crash history, several segments along Pine Street have been identified as high crash locations (HCL) by VTrans³. The majority of the crashes in those segments have occurred at intersections; a not uncommon occurrence on streets located in a densely developed city environment having closely spaced intersections. For example, in the HCL segment between mile markers (mm) 0.20 - 0.50 (including Sears Lane, Birchcliff Pkwy and Lakeside Ave), 30 of the 47 crashes occurred at the three intersections. Lakeside Ave alone accounted for 20 crashes. Similarly, in the HCL segment between mm 0.80 - 1.10 (including Howard St, Marble Ave and Kilburn St), 26 of the 38 crashes occurred at the three intersections. Lastly, in the HCL segment between mm 1.10 - 1.40 (including Maple St and King St), 25 of the 53 crashes occurred at the two intersections. None of the above intersections have been identified as an intersection HCL. Without the intersection crashes, only the mm 1.10 - 1.40 segment would have an actual/critical crash ratio above 1.0, and continue to be classified as a high crash location. The foregoing crashes are predominantly minor in nature and largely involve rear-end or sideswipe collisions.

Conclusions

From the foregoing analyses, we have formed the following conclusions and recommendations regarding the potential traffic congestion and safety impacts of this Project:

- Intersection capacity analyses at the Pine St/Howard St intersection indicate that acceptable levels of service will be maintained with this Project.
- We have no reason to anticipate that the small volume of additional traffic resulting from this Project will adversely impact existing traffic safety conditions on Pine and Howard Streets.



³ 2010-2014 High Crash Location Report, Vermont Agency of Transportation, November 2015

APPENDIX A

**Intersection Capacity Analysis
Worksheets**

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	R. Dickinson			Intersection	Pine St & Howard St			
Agency/Co.	L&D			Jurisdiction	Burlington			
Date Performed	1/17/2017			Analysis Year	2018 No-Build			
Analysis Time Period	AM Peak Hour							
Project Description 07004								
East/West Street: Howard St				North/South Street: Pine St				
Intersection Orientation: North-South				Study Period (hrs): 1.00				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)		443	55	19	607			
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00		
Hourly Flow Rate, HFR (veh/h)	0	443	55	19	607	0		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration			TR	LT				
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				25		67		
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00		
Hourly Flow Rate, HFR (veh/h)	0	0	0	25	0	67		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (veh/h)		19		92				
C (m) (veh/h)		1076		415				
v/c		0.02		0.22				
95% queue length		0.05		0.85				
Control Delay (s/veh)		8.4		16.1				
LOS		A		C				
Approach Delay (s/veh)	--	--		16.1				
Approach LOS	--	--		C				

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Analysis Time Period	AM Peak Hour						
Project Description 07004							
East/West Street: Howard St				North/South Street: Pine St			
Intersection Orientation: North-South				Study Period (hrs): 1.00			
Vehicle Volumes and Adjustments							
Major Street	Northbound			Southbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)		443	64	22	607		
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR (veh/h)	0	443	64	22	607	0	
Percent Heavy Vehicles	0	--	--	0	--	--	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	0	1	0	0	1	0	
Configuration			TR	LT			
Upstream Signal		0			0		
Minor Street	Eastbound			Westbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)				26		69	
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR (veh/h)	0	0	0	26	0	69	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)		0			0		
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	0	0	0	0	0	
Configuration					LR		
Delay, Queue Length, and Level of Service							
Approach	Northbound	Southbound	Westbound			Eastbound	
Movement	1	4	7	8	9	10	11
Lane Configuration		LT		LR			
v (veh/h)		22		95			
C (m) (veh/h)		1068		409			
v/c		0.02		0.23			
95% queue length		0.06		0.90			
Control Delay (s/veh)		8.4		16.5			
LOS		A		C			
Approach Delay (s/veh)	--	--		16.5			
Approach LOS	--	--		C			

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Analysis Time Period	PM Peak Hour						
Project Description 07004							
East/West Street: Howard St				North/South Street: Pine St			
Intersection Orientation: North-South				Study Period (hrs): 1.00			
Vehicle Volumes and Adjustments							
Major Street	Northbound			Southbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)		472	95	80	668		
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR (veh/h)	0	472	95	80	668	0	
Percent Heavy Vehicles	0	--	--	0	--	--	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	0	1	0	0	1	0	
Configuration			TR	LT			
Upstream Signal		0			0		
Minor Street	Eastbound			Westbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)				20		40	
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR (veh/h)	0	0	0	20	0	40	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)		0			0		
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	0	0	0	0	0	
Configuration					LR		
Delay, Queue Length, and Level of Service							
Approach	Northbound	Southbound	Westbound			Eastbound	
Movement	1	4	7	8	9	10	11
Lane Configuration		LT		LR			
v (veh/h)		80		60			
C (m) (veh/h)		1015		299			
v/c		0.08		0.20			
95% queue length		0.26		0.75			
Control Delay (s/veh)		8.9		20.1			
LOS		A		C			
Approach Delay (s/veh)	--	--		20.1			
Approach LOS	--	--		C			

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Vehicle Volumes and Adjustments							
Major Street	Northbound			Southbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)		472	99	83	668		
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR (veh/h)	0	472	99	83	668	0	
Percent Heavy Vehicles	0	--	--	0	--	--	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	0	1	0	0	1	0	
Configuration			TR	LT			
Upstream Signal		0			0		
Minor Street	Eastbound			Westbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)				22		43	
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR (veh/h)	0	0	0	22	0	43	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)		0			0		
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	0	0	0	0	0	
Configuration					LR		
Delay, Queue Length, and Level of Service							
Approach	Northbound	Southbound	Westbound			Eastbound	
Movement	1	4	7	8	9	10	11
Lane Configuration		LT		LR			
v (veh/h)		83		65			
C (m) (veh/h)		1012		293			
v/c		0.08		0.22			
95% queue length		0.27		0.85			
Control Delay (s/veh)		8.9		20.8			
LOS		A		C			
Approach Delay (s/veh)	--	--		20.8			
Approach LOS	--	--		C			